

CITY OF NORTHAMPTON – PUBLIC WATER SUPPLY

YEAR 1 IMPLEMENTATION OF FOREST STEWARDSHIP PLANS ON WATER SUPPLY PROPERTY

PHOTOGRAPH UPDATE – MARCH 10, 2014

In 2012, the City of Northampton (City) Department of Public Works completed Forest Stewardship Plans for city-owned watershed property. These plans were approved by the Department of Conservation and Recreation. They present a 10-year plan for managing watershed land. The goal is to maintain, protect and enhance the watershed functions of the forest by creating, over time, a diverse forest of vigorous, site-adapted native trees growing to a mature size within a forest framework that is constantly regenerating with desirable new trees.

The plans also describes the overall forest health while describing the importance of a forested watershed, which is its ability to capture, slow, store, filter and gradually release rainfall and snowfall into the reservoir. This function is best done by a vigorous forest of site-adapted trees with a tall canopy. Over time, as disturbances occur the established trees will shed seed and young trees will become established. These young trees quickly take up any new growing space. Watershed management will result in a significant reserve of young trees to improve resiliency in the face of inevitable disturbance such as storms damage, pests, and disease.

The present health of the forest is problematic because of the forest's compromised ability to regenerate itself to desirable species as disturbances occur. There is no single cause for this, but rather a set of contributing causes that includes densely-shading overstories in some areas, certain pests and disease that are attacking some tree species, a combination of excessive herbivore feeding (deer and moose); aggressive growth of certain native vegetation (primarily wild grape vines); and aggressive growth of non-native invasive plants (primarily the oriental bittersweet vine). The current watershed forest is lacking an essential reserve of young trees, and given the severity of the interfering factors the forest may not be able to develop a reserve of young trees.

During the 2013/2014 winter, the City began forest management activities using a harvest of timber, firewood and pulpwood on five forest stands on water supply property surrounding the Francis P. Ryan and West Whately reservoirs in Conway, Whately, and Williamsburg. The following photographs are from this winter's harvest. The goal of these harvests were mainly to thin the forest by removing poorer quality trees, thereby giving the remaining trees more room to grow; and to create openings in order to have sufficient area for neighboring white pines and red oaks to grow and to provide seeds for regeneration; and to grow new trees in the openings.

Questions about these photographs or the City's Forest Stewardship Plans in general can be directed to:

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On November 9, 2013 the City of Northampton DPW and their consulting forester hosted a Pre-Harvest Walk on water supply property. This picture shows attendees listening to the consulting forester discuss the importance of forest stewardship planning, the relationship between a healthy forest and water quality protection and the silvicultural treatments to occur in forest stands near one of the City's largest drinking water reservoirs.



Forest Cutting Plan Certificate issued by Department of Conservation and Recreation (DCR). Most timber harvesting in Massachusetts falls under the jurisdiction of Massachusetts General Laws, Chapter 132; which requires the landowner to prepare a forest cutting plan and submit it to DCR for approval. A copy of the cutting plan is sent to the Conservation Commission within the municipality where the harvest will occur and they have an opportunity to review. If the proposed harvesting falls within a known or anticipated habitat of a rare, threatened or endangered species the plan is reviewed by the Natural Heritage and Endangered Species Program (NHESP). If all the requirements of the law are met, DCR issues the permit and the Forest Cutting Plan Certificate (orange sign) which is to be posted at the logging area.



Post-harvest photograph of a small opening in the forest created by the cutting of hemlock (timber & pulp) and firewood (mostly, black birch). New trees can become established in the opening and the tall trees around the edge (white pines and oaks) will get more sunlight and their growth will improve. Many of the hemlocks that were not cut are likely to die due to the elongate hemlock scale and/or the hemlock woolly adelgid, but were left to serve as eventual snags, an important wildlife habitat for certain species and later will provide habitat on the ground. The stump and extra branches ("slash") on the ground will benefit the soil (through decomposition) and will also serve as wildlife habitat.



Image of the elongate hemlock scale shown on the underside of hemlock needles. Elongate hemlock scale is an introduced pest that is causing (along with the hemlock woolly adelgid, another introduced pest) a prolonged process of decline on hemlock populations in our area. Evidence of the possible presence of this scale or woolly adelgid consists of thinned crowns.



Post-harvest image of crowns of red oak trees in winter with room to grow. Dead hemlock to the right of the oaks will provide habitat for a range of species including woodpeckers, birds and other small mammals. Hemlocks in the background show the thinning effect caused by scale and wooly adelgid insects.



Post-harvest image of a standing dead tree, often referred to as a snag, of American beech in a small opening. The crowns of the red oak trees around the edge of the opening will benefit from increased sunlight. Note the thin crowns of the hemlocks in the background.



Post-harvest view of the canopy after a small opening was created. While this opening will allow for the establishment of new seedlings, the main benefit is the thinning of the area giving the tall tree crowns (red oaks and hemlocks) more room to grow. Future cuttings could enlarge openings such as this to allow better establishment of seedlings. The long term objective is to have a forest that is well stocked with native trees of all ages and sizes.



Post-harvest image of slender oaks and hemlocks in a dense grove. The thinning was designed to give more light to the tree crowns by removing competing trees. Most trees cut in this project were black birch and hemlock. Leftover branches ("slash") were left on the ground and will serve as habitat. Decomposition of this material will enrich the soil. In steep areas, slash can be used to minimize erosion and stabilize logging trails. Another way to avoid erosion is to avoid logging on steep ground. In this stand, no logging was done on any of the steep terrain.



"Slash" on the ground in an opening created in 2014 harvest. The term "slash" describes the branches, tops, and other parts of trees that are left behind in a logging operation after the trunk of the tree is taken. The quantity of slash produced increases when the trees to be cut are of low commercial quality (because less of the tree is usable). With one exception (discussed below), the slash does not have any commercial value. During a harvest, the slash acts as a mat to reduce potential impacts of logging equipment on the soil. Over time, the slash will protect the soil and ultimately decompose and improve the soil by adding both organic matter and nutrients while providing important wildlife habitat. In some cases, slash can prevent erosion, though that is not a factor in this picture.

There are logging systems that will remove most of the slash. These are generally referred to as whole-tree chipping systems, and the chips are generally taken to be burned in electricity generating plants (e.g., in Westminster, MA) or in co-generation facilities, such as Cooley Dickinson Hospital. One benefit to whole-tree chipping systems is that they create a "cleaner" effect. This effect may be important if recreational use of the land is a priority, if there is a fire hazard concern, or if the land is being cleared for a different purpose (e.g. pasture or development).

In preparing this harvest out to bid, the City specifically excluded whole-tree chipping systems in the expectation that the greatest short-term and long-term benefit to the forest will come from leaving the slash.



Another image of slash (hemlock and black birch) at the edge of an area where no cutting was done. Slash isn't necessarily pretty and certainly isn't fun to walk through, but in this stand, about 20 acres out of 45 acres was cut, so it is not hard to walk around the slash if necessary. The slash in this photo will decompose and will be replaced by new trees or shrubs. Massachusetts forests are very dynamic. This forest was once a farm. In order to create that farm, the original forest had to be cut down and used for timber and firewood and the rest burned. The stumps were pulled out of the ground and the land was kept in a grassy condition for decades if not 100 years or more. When the farming was done, the land was abandoned and grew naturally back into a white pine forest. When that forest was cut off for timber, it grew into the present hemlock-oak-birch mix, with smaller amounts of pine. The management undertaken here will not clear the forest but, instead, will add structural diversity, allowing new trees to grow in small pockets up to about 3/4 acre in size within a framework of surrounding, taller older trees. The intention is to have a diverse and vigorous forest. The climate, soils and tree species of Massachusetts are very well suited to this.



Pile of firewood from the City of Northampton water supply property. Firewood is an important local commodity and tradition in New England. If ordering a cord of seasoned, cut and split wood (say, for \$250) seems like quite an expense, it is NOT because the wood itself is so valuable. Standing firewood (trees to be cut in the forest) is usually valued at about \$10 per cord. The rest of the \$250 charge reflects the labor and equipment to do the logging, trucking, processing, storing, and delivering of the wood. Some people have full length firewood delivered to their house and save money by cutting, splitting and seasoning it themselves.

As a landowner, the City is not selling the firewood to make money. Rather, having firewood (and timber and pulp) to sell is what brings the loggers out to the woods so that the work of creating structural diversity in the forest (by logging) can be done.



Forwarder loaded with firewood and pine logs driving through snow. The forwarder is an 8-wheel machine with 4 pairs of wheels enclosed in tracks. The logs are self-loaded into the bunk by the loading arm. The bunk of the forwarder can also be used to carry smaller branches and "slash" to lay down in wet or low spots in the logging trails, and the loader arm can be used to set these materials in place.



Set of two rubber tires on a forwarder enclosed in a metal track. The forwarder is used to carry logs out of the forest. The logs are carried in a metal bunk. The track on the rubber tires helps spread the weight of the machine and improve traction and also helps protect the tires from slash, stumps, rocks, etc. Behind the empty bunk: a pile of log-length firewood.



This tracked timber harvester/processor is being used to fell most of the trees for the 2014 harvesting work. The felling head at the end of the arm contains a chainsaw that cuts the tree, which is then pulled through the head and to be delimbed and cut into logs of various lengths. This type of machine is helpful when there are a large number of small- or medium-sized trees to be cut with little value. The logs (firewood, pulp and/or timber) are left in small piles that can be picked up by the forwarder. The larger trees are still cut by a logger standing on the ground with a conventional chainsaw.



Close-up view of the felling head of the timber harvester/processor. The chainsaw bar is not visible. The large fingers grab the tree and can quickly lift the tree off the ground once it is cut; efficiently and safely. The spiked metal rollers rotate to push the log through the grip of the fingers, peeling off branches (see pile in background of picture). Without mechanized harvesting equipment, it would be difficult if not impossible for loggers to make a living cutting the large number of small- to medium-sized, low-quality trees that need to be cut in order to create the desirable forest conditions defined in the Forest Stewardship Plan for the City's watershed forest. The ability to work quickly has the added advantage of being able to capitalize on good logging conditions (i.e. frozen ground conditions) such as we have had in the winter of 2014.



Group of tall white pines free to grow after thinning. A small opening is in the foreground.



On February 15, 2014, DPW hosted another forest walk. This walk was during the active harvest and attendees got a close up view of the timber harvester in action.



An image of one of the larger openings created during the 2014 harvest. This opening is about 3/4 acre and will fill in naturally overtime with a diversity of vegetation, including blackberries and goldenrods, as well as young trees, possibly including black cherry and/or pin cherry. The vegetation and the slash will attract a variety of insects, including pollinators, which will in turn attract a variety of birds and small mammals. Most openings are about 1/3 acre or less, such that if a tree falls into the opening, its top might reach the middle of the opening or fall all the way across the opening. Trees that become established in these smaller openings will generally require additional cutting around the edge of the opening in the future if they are to be free to grow, especially oaks or black cherries. Black birch, on the other hand, is somewhat exceptional in its ability to grow up through what is known as "tall shade".



Image of a large red oak on the edge of a new opening. Note the rough white pine tree in the background, which was retained for its structural habitat value. The large crown of this oak will benefit from the increased sunlight and will produce more acorns, adding to the habitat draw of the nearby opening and hopefully (with the help of blue jays) seeding in some new oaks.



Image of a blockade of logging road using un-merchantable logs. Unfortunately, logging access into the forest usually needs to be blocked off to prevent illegal dumping, driving of vehicles, and other unwanted uses. For permanent roads at the City of Northampton watershed, gates are used. For infrequently used logging trails, using these local, handy and biodegradable barriers makes the most sense.



Two log trucks on the log landing. The "landing" is the area where the logs are brought out of the woods, sorted and stacked, and then loaded onto trucks. The town road is in the foreground. Often, the landing is the only part of a logging operation that people see. The truck in the back has a full load of firewood (ca. 8 cords of mostly black birch) and is loading hemlock pulp onto the flatbed truck in front. The firewood is being brought to Whately for processing and local resale. The hemlock pulp is being brought to Huntington and then re-shipped to a paper mill in New York. The log pile at the far end of the landing is red pine. The red pine logs are being brought to sawmill in Williamsburg, unless they are too small, in which case they are being sent to a sawmill in Quebec. The hardwood logs are going to a sawmill in Southern Vermont. The hemlock and white pine logs are going to the same sawmill in Williamsburg as the red pine. The slash (branches and other unusable parts of the tree) are being left in the woods to provide a range of benefits, although the slash could have been chipped and taken to a chip burning plant such as the cogeneration plant at Cooley Dickinson Hospital or the electricity plant in Westminster.



Slash and small trees (poles) were laid in place on the approaches to this stream and in the stream to create this stream crossing. At the end of the job, the poles and slash will be removed from the stream, but the mat of brush on the approaches to the stream will be left in place to stabilize the banks. All stream crossings are addressed in the Forest Cutting Permit and are designed to prevent any sediment (e.g. mud) from entering the stream.



Opening of about 1/2 acre in size that was made by cutting a small plantation of red pines. Red pines were planted in various locations on the watershed about 80 years ago on old pasture land and have reached a point of stagnation in their growth due to a number of pests. Even red pines that have been thinned do not show an improvement in vigor. The small opening is bounded by a tall white pine stand to the east and a number of maturing red oaks to the west and north. With a black cherry seed source nearby, and with the ability of black cherry seeds to remain viable in the soil for many years, it will be interesting to see if black cherry trees grow in this new opening. If they do, we will keep our fingers crossed that the abundant local moose do not come through and bite off the tops.



Image of barbed wire grown into an old hemlock tree in a fence row within the logging area. Like most of our present-day forests, this stand was also part of a 19th century farm that grew back into white pine after the farming came to an end. When the white pine was cut (usually clear cut), the land grew back into a mix mainly of hemlock, oaks and birches. The trees in the fence row pre-date the surrounding forest.



Stump (of oak) surrounded by young trees (oaks in the foreground). The stump probably dates back to the construction of the reservoir. Because of the steep slope down to this area, it was not included in the winter 2014 logging. The Forest Stewardship Plan evaluated each stand for its suitability to logging. Areas that were steep, wet, or very remote, or that were overrun with wild grapes or non-native invasive plants such as oriental bittersweet, were excluded from logging. The reservoir is in the background.



A beautiful beech tree (American beech) in one of the no-cut areas. This tree is unusual in that it (and a few of its neighbors) are not infected with the beech bark disease complex that has disfigured (with bark cankers) most of the beech in the Northeast, often causing an early death. Some beech (like these) appear to have a genetic resistance to beech bark disease complex. The beech nut is an important source of nutrition for black bears, which will climb trees to get them.



A pair of white oaks in the logging area. White oak is one of a number of native trees (e.g. sugar maple, black cherry, beech) that are not abundant in the logging area. Identifying and keeping these trees is an important step in preparing for forest management that seeks to maintain and increase biodiversity. One possible outcome of keeping these white oaks is that new white oaks will seed in to the nearby opening so that, over time, the less-common species become more abundant.



Part of the impressive stone foundations that belonged to a sawmill on Avery Brook. The sawmill site is about 1/2 mile upstream from the logging area. Avery Brook, or West brook, as it is sometimes still called, is said to have had seven major mill sites, or mill "privileges". This was the site furthest upstream. With the limited transportation capabilities at that time, most of the logs going into the mill would have come from the immediate vicinity, including possibly from the area of the winter 2014 logging.



Remains of a hemlock that died in place and eventually broke off, leaving a stump. The rotten wood at the top of tall stumps is often used by chickadees, nuthatches and small woodpeckers, which peck out small nesting chambers.



View of Stand 19 from the west, about two weeks after logging was complete in this area. The hillside features a mix of hardwoods such as red oak, black birch, paper birch, red maple, shadbush, and American beech, along with white pines. A few hemlocks remain at the top of the slope. The dark, low vegetation at the bottom of the slope is mountain laurel. On the left side of the slope (not visible in this photo) there is an old, narrow cart road that was hand-dug into the side of the slope, presumably in the late 1700's.

The steep sides of Stand 19 were not part of the recent logging. The City uses logging as a tool to shape the watershed forest. In many areas of the forest, the trees are crowded together, limiting each other's ability to grow freely and be vigorous. Also, there are few areas with young trees that are free to grow (i.e., there are few areas with young trees that are not shaded out by tall trees). Ideally, the watershed forest would be well-stocked with vigorous trees in a range of sizes and ages that are free to grow. Logging can help make this happen. Logging crews are brought in to cut trees that have been selected and marked with paint by the City's consulting forester. In some cases, the marking results in a thinning effect, giving nearby trees more room to grow. In other cases, the marking creates small openings in the forest that can fill in with new trees that grow naturally from native seed, re-sprouting, or from pre-existing seedlings. In other areas, no marking is done at all and the forest in that area is not cut. These "no cut" areas include land that is steep; wet or too remote; and areas with established populations of non-native invasive plants or native grape vines. These areas are "no cut" because it is felt that the anticipated benefits of logging (described above) would be outweighed by negative consequences (e.g. erosion, rutting of soil, or causing an increase in undesirable vegetation). The City's Forest Stewardship Plan, prepared in 2012, delineates in a broad way the areas that are suitable or not suitable for logging at this time. When the forester goes to mark areas that are considered suitable for logging (such as Stand 19), there is a further determination within that stand of areas that are or are not suitable for logging. Of 45 acres in Stand 19, logging was carried out on about 20 acres, and the remainder, such as these steep slopes leading down to the reservoir, was not logged.